



Sequence Listing

(1)GENERAL INFORMATION:

(i)APPLICANT: KAWASAKI, Hideki  
TOKAI, Masaya  
KIKUCHI, Yasuhiro  
OUCHI, Kozo

(ii)TITLE OF INVENTION:DNA ENCODING PROTEIN COMPLEMENTING  
YEAST  
LOW TEMPERATURE-SENSITIVE FERMENTABILITY

(iii)NUMBER OF SEQUENCES: 2

(iv)CORRESPONDENCE ADDRESS:

(A)ADDRESSEE: FITZPATRICK, CELLA, HARPER & SCINTO  
(B)STREET: 30 Rockefeller Plaza  
(C)CITY: New York  
(D)STATE: New York  
(E)COUNTRY: U.S.A.  
(F)ZIP: 10112-3801

(v)COMPUTER READABLE FORM:

(A)MEDIUM TYPE: Diskette - 3.50 inch, 1440 kb storage.

(B)COMPUTER: IBM PS/V  
(C)OPERATING SYSTEM: MS-DOS Ver3.30  
(D)SOFTWARE: PATENT AID Ver1.0

(vi)CURRENT APPLICATION DATA:

(A)APPLICATION NUMBER: US/09/678,023  
(B)FILING DATE: 04-OCTOBER-2000

(vii)PRIOR APPLICATION DATA:

(A)APPLICATION NUMBER: 08/894,344  
(B)FILING DATE: 15-AUGUST-1997  
(A)APPLICATION NUMBER: JP343700/95  
(B)FILING DATE: 28-DECEMBER-1995  
(A)APPLICATION NUMBER: PCT/JP96/03862  
(B)FILING DATE: 27-DECEMBER-1996

(viii)ATTORNEY/AGENT INFORMATION:

(A)NAME: Perry, Lawrence S.  
(B)REGISTRATION NUMBER: 31865

(ix)TELECOMMUNICATION INFORMATION:

(A)TELEPHONE: 212-218-2100  
(B)TELEFAX: 212-218-2200

(2)INFORMATION FOR SEQ ID NO: 1 :

(i)SEQUENCE CHARACTERISTICS:

(A)LENGTH: 8874 base pairs  
(B)TYPE: nucleic acid  
(C)STRANDEDNESS: double  
(D)TOPOLOGY: linear

(ii)MOLECULE TYPE: Genomic DNA

(vi)ORIGINAL SOURCE:

(A)ORGANISM: Saccharomyces cerevisiae  
Page 1

(B)STRAIN: X2180-1B

(ix)FEATURE:

(A)NAME/KEY: CDS  
(B)LOCATION: 1 to 8874  
(C)IDENTIFICATION METHOD: E

(ix)FEATURE:

(A)NAME/KEY: cleavage-site  
(B)LOCATION: 1291 to 1296  
(C)IDENTIFICATION METHOD: S

(ix)FEATURE:

(A)NAME/KEY: cleavage-site  
(B)LOCATION: 4388 to 4393  
(C)IDENTIFICATION METHOD: S

(ix)FEATURE:

(A)NAME/KEY: cleavage-site  
(B)LOCATION: 5027 to 5032  
(C)IDENTIFICATION METHOD: S

(ix)FEATURE:

(A)NAME/KEY: cleavage-site  
(B)LOCATION: 7675 to 7680  
(C)IDENTIFICATION METHOD: S

(xi)SEQUENCE DESCRIPTION: SEQ ID NO: 1

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TGT TTG ACA ATG ATA TTC TAC ATG GGA AGA ATC TAT GCA TAC CTT GTA  144
AGT TTT ATA TTA GAA TGG CTA CTA TGG AAA CGA GCG AAA ATC AAG ATA  192
AAT GTT GAG ACA CTT CGT GTC TCC TTA CTA GGT GGT CGA ATA CAT TTT  240
AAA AAC CTT TCC GTA ATA CAC AAA GAT TAT ACA ATT TCG GTA TTA GAG  288
GGT AGT TTA ACA TGG AAA TAC TGG CTT TTA AAT TGC AGA AAA GCA GAA  336
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TTT AGC GAT GGA AGT AGT GCT GAT AAA TTA GAT GAA GAT CTA AGC GAA  576
TCT GCA TAC ACA ACG AAC TCT GAT GCA TCA ATT GTT AAT GAC AGG GAC  624
TAC CAA GAA ACA GAT ATC GGC AAA CAT CCA AAG CTA CTG ATG TTT TTA  672
CCA ATT GAG CTT AAA TTT AGC CGC GGT TCC CTA CTG TTA GGA AAC AAA  720
TTC ACG CCA TCT GTT ATG ATT CTA AGT TAT GAA AGT GGA AAA GGC ATA  768
ATA GAT GTT TTA CCT CCA AAA GAG CGA TTA GAT TTA TAC AGA AAT AAA  816
ACA CAG ATG GAA TTC AAA AAC TTC GAA ATT TCT ATC AAA CAA AAT ATT  864
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GGT TAC GAT GAT GCT ATT GGA TTG AAG TTT AAA ATA GAT AGA GGG AAA 912  
GTG TCA AAG TTA TGG AAA ACG TTT GTA CGA GTC TTT CAG ATA GTA ACC 960  
AAG CCT GTT GTA CCG AAA AAG ACT AAA AAA AGC GCA GGC ACA TCA GAT 1008  
GAC AAT TTC TAT CAT AAA TGG AAA GGT TTA TCT CTT TAT AAG GCT TCT 1056  
GCG GGC GAC GCT AAA GCA AGT GAT TTA GAT GAT GTT GAG TTC GAT TTG 1104  
ACG AAC CAT GAA TAT GCT AAA TTT ACA TCA ATT TTA AAA TGC CCA AAG 1152  
GTC ACA ATT GCA TAT GAC GTG GAT GTT CCG GGC GTT GTG CCA CAT GGT 1200  
GCA CAT CCG ACA ATA CCT GAT ATT GAT GGA CCA GAT GTG GGC AAT AAC 1248  
GGA GCA CCT CCA GAT TTT GCT TTA GAT GTT CAA ATT CAC GGA GGA TCC 1296  
ATC TGT TAC GGA CCT TGG GCT CAA AGA CAA GTC AGT CAT CTA CAA AGA 1344  
GTT CTA TCA CCG GTA GTT TCA AGG ACA GCC AAA CCT ATA AAA AAA CTC 1392  
CCG CCA GGT TCT AGA AGA ATA TAT ACA CTT TTC AGG ATG AAT ATA TCA 1440  
ATA ATG GAA GAT ACT ACT TGG CGT ATA CCG ACG AGG GAA AGT AGC AAA 1488  
GAC CCC GAA TTT TTG AAA CAC TAC AAA GAA ACT AAT GAA GAA TAT AGG 1536  
CCA TTT GGA TGG ATG GAT CTC CGA TTT TGT AAG GAC ACC TAT GCA AAT 1584  
TTC AAT ATA AGT GTT TGT CCT ACA GTG CAA GGT TTT CAG AAT AAT TTC 1632  
CAT GTT CAT TTC CTG GAA ACC GAA ATT AGG TCA AGT GTT AAT CAC GAT 1680  
ATT TTG TTA AAA AGC AAG GTA TTC GAT ATT GAT GGG GAT ATT GGA TAT 1728  
CCA TTG GGT TGG AAT AGC AAA GCT ATA TGG ATA ATT AAC ATG AAG TCA 1776  
GAA CAA TTA GAG GCG TTT CTG CTA CGT GAG CAT ATA ACT TTA GTT GCA 1824  
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TTT AAC GAA AAC TGT TAT TTA TCC CTT CAT GGT GAT AAG CTT TCA ATT 2016  
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CCT TGG AAT ACA TTG AAC GAA TTC ATG AAA CAT AAA GAA GTG GGG AGA 2160  
GCA TAC GAC TTT ACA ATT AAA GGT TCT TAC CTT CTC TAT TCC GAG TTA 2208  
GAT ATT GAT AAT GTC GAT ACG CTA GTC ATA GAG TGT AAC AGC AAG AGT 2256  
ACA GTA CTT CAC TGC TAT GGG TTT GTC ATG AGG TAT TTA ACA AAC GTA 2304  
AAG ATG AAT TAC TTC GGT GAA TTT TTT AAT TTT GTG ACG TCA GAA GAG 2352  
TAC ACA GGT GTC CTT GGC GCT AGG GAA GTC GGA GAT GTC ACT ACG AAA 2400

AGC TCG GTG GCA GAT TTG GCA TCT ACT GTA GAT TCA GGG TAC CAA AAT 2448  
 AGC AGT CTA AAG AAC GAA TCT GAG GAT AAA GGT CCT ATG AAA AGG TCA 2496  
 GAT TTG AAA AGG ACT ACC AAC GAA ACT GAT ATT TGG TTC ACA TTT TCG 2544  
 GTT TGG GAT GGT GCT CTG ATA TTA CCA GAA ACG ATT TAC AGT TTT GAT 2592  
 CCA TGC ATT GCA CTA CAT TTT GCC GAA CTT GTA GTG GAT TTC AGA AGT 2640  
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 AAG CGG CAC GTT TCA AAA CAA ATA AAT GAA GTA TTT GAT TTT ATA CGT 2736  
 CGT AAT AAC GGA GCT GAT GAG CAA GAG CAC GGA TTG CTT TCG GAC CTC 2784  
 ACC ATT CAT GGA CAT AGA ATG TAT GGA TTA CCA CCC ACA GAA CCT ACC 2832  
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 GGC CTT AAA GAT CCG GTG ATG AAA TCT CAA TCA GTT ATT AGT GCT GAA 3072  
 TCG ATA TTG TTT ACT TTG ATC GAC TTT GAA AAC GAA AAA TAT TCA CAA 3120  
 AGA ATA GAC GTG AAA ATT CCA AAA TTG ACA ATT TCG TTA AAT TGC GTG 3168  
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 AGA TTT ACA AAC TTT GAG CAA TAC AAG GAT ATC GAT AAA AAA AGA TCA 3264  
 GAA CAA CGC AGA TAT ATA ACA ATA CAC GAT TCA CCC TAT CAT AGG TGT 3312  
 CCT TTT CTT CTT CCG CTG TTC TAT CAG GAT TCG GAT ACA TAC CAA AAC 3360  
 CTG TAC GGG GCT ATA GCA CCA TCT TCG TCT ATC CCA ACT TTA CCT CTT 3408  
 CCC ACT TTG CCT GAT ACT ATA GAT TAT ATC ATT GAA GAT ATT GTG GGC 3456  
 GAG TAT GCT ACC CTT CTG GAG ACC ACA AAT CCA TTC AAG AAC ATA TTC 3504  
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 TCA TAT ATT CTG TTG GAT GTC GAC CCG TTG CTT TTT ATT TTC GCT AAG 3696  
 AGT TTA TTA GAA CAG CTT TAC TCT GAA AAC ATG GTA CAA GTC TTA GAC 3744  
 GAT ATT GAA ATT GGG ATT GTG AAA CGA TTA AGC AAC CTT CAA GAA GGG 3792  
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 AGG TTA CTT AAA TTG CAA GAT CTT ATT CCA CTC ATT GCA GCA GTG GGC 4848  
 GAA GAT GAC AAA AGT GAT CCA AAA AAG GAG TTA TCA AAG CAA TTC AAA 4896  
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 GAC CAA ACG AAG CTG ATG AGT AGA ACA GTT GGG GGT AGA GTT AGT TTA 4992  
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 ATA TTT TCC CAG AAA TCG GAA GTG TGG TTA AAA CAC ACA TCT GTC ATT 5088  
 TTG GGA GAA GCT CAA CTG CGC GAC TTT TCA GTT TTA GCG ACT ACT GAG 5136  
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 AAA CCT AAA TCA AAG AAA AAG TCC CAA TTT GTC GAC CAG AAA ATT AAT 5328  
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GAT TTT TTC ATG ACA TCG CAC CAG ACA AAG GAG CAA TAC CTA AGG TTT 5520  
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TCG GAG CCG CGC CGT ATT GTA AAC AGT TTT TTA CAA GAT GAA AAG CTT 5664  
GCT TCT CAG GGT ATC AAT CTG TTA TAT TCC CTG AAG CCT TTA TTC TTT 5712  
AGT TCA AAT CTA CCA AAA AAA GAG AAG CAG GCA CCC TCG ATA ATG ATA 5760  
AAT TGG ACA TTA GAT ACT AGC ATT ACT TAT TTT GGT GTT CTT GTG CCA 5808  
GTG GCT TCC ACG TAT TTC GTG TTT GAA TTA CAT ATG CTG CTA CTT TCT 5856  
CTG ACC AAT ACG AAT AAC GGT ATG TTA CCA GAA GAA ACC AAG GTG ACG 5904  
GGA CAG TTT TCC ATC GAA AAC ATC CTA TTT CTA ATA AAG GAG CGG TCA 5952  
CTA CCC ATT GGT CTT TCC AAA TTA CTC GAC TTT TCC ATA AAA GTA TCA 6000  
ACC CTA CAA AGA ACG GTT GAT ACG GAG CAG TCA TTC CAA GTG GAA AGT 6048  
TCT CAT TTC AGG GTC TGC TTA TCT CCT GAT TCT CTA TTA AGA TTA ATG 6096  
TGG GGC GCG CAT AAA TTG CTA GAC TTG AGC CAT TAC TAT TCA AGA CGC 6144  
CAT GCC CCT AAT ATT TGG AAC ACT AAG ATG TTC ACC GGT AAA AGT GAT 6192  
AAG TCA AAA GAA ATG CCC ATA AAT TTC CGT TCA ATA CAC ATC CTG TCC 6240  
TAT AAA TTT TGT ATT GGG TGG ATA TTC CAG TAT GGA GCA GGC TCC AAT 6288  
CCT GGG TTA ATG TTA GGT TAT AAC AGA TTG TTT TCA GCA TAT GAA AAG 6336  
GAT TTT GGG AAA TTC ACA GTT GTG GAC GCT TTT TTC TCT GTT GCG AAT 6384  
GGT AAT ACC TCA AGC ACT TTT TTC TCT GAA GGA AAC GAG AAA GAC AAA 6432  
TAT AAT AGA AGT TTC TTG CCA AAC ATG CAA ATA TCC TAC TGG TTC AAA 6480  
AGA TGT GGT GAG TTG AAA GAT TGG TTT TTT AGA TTT CAT GGT GAA GCA 6528  
CTG GAT GTA AAC TTT GTC CCG TCA TTC ATG GAT GTC ATT GAG TCT ACT 6576  
TTA CAA TCC ATG CGA GCA TTT CAA GAG CTG AAA AAG AAC ATT CTG GAT 6624  
GTG TCC GAG AGT TTG CGT GCG GAA AAT GAT AAT TCT TAT GCT AGT ACC 6672  
AGT GTC GAA AGT GCT TCG AGT AGT TTG GCT CCC TTT CTC GAT AAC ATT 6720  
AGA TCT GTT AAC TCA AAT TTC AAG TAT GAC GGT GGT GTA TTT AGG GTT 6768  
TAC ACG TAC GAA GAT ATT GAA ACC AAG AGT GAG CCA TCT TTT GAA ATA 6816  
AAA AGT CCA GTA GTC ACT ATA AAC TGT ACA TAT AAA CAT GAT GAA GAT 6864  
AAA GTT AAG CCA CAT AAA TTC AGA ACA TTA ATC ACT GTC GAC CCA ACG 6912  
CAT AAT ACT TTG TAT GCG GGA TGT GCT CCT TTA TTA ATG GAA TTT TCT 6960  
GAA AGT CTG CAA AAG ATG ATA AAG AAA CAT AGC ACC GAC GAA AAA CCA 7008

AAC TTT ACA AAA CCT TCT TCA CAG AAT GTT GAT TAT AAG CGA CTT TTG 7056  
GAT CAA TTT GAT GTG GCT GTA AAA CTA ACA TCA GCC AAG CAA CAG CTA 7104  
AGT TTG AGC TGT GAA CCA AAA GCT AAG GTT CAG GCA GAT GTT GGA TTT 7152  
GAA TCG TTT TTG TTC AGT ATG GCT ACC AAT GAG TTC GAC TCT GAA CAG 7200  
CCT TTG GAG TTT TCT TTA ACT CTA GAA CAC ACA AAA GCG TCC ATT AAG 7248  
CAC ATA TTT TCA AGA GAA GTA AGT ACG TCC TTT GAA GTT GGT TTC ATG 7296  
GAC TTG ACG CTT TTA TTT ACA CAT CCT GAT GTA ATC AGT ATG TAT GGA 7344  
ACG GGG TTG GTT TCT GAT CTA AGC GTC TTC TTC AAT GTA AAG CAG CTC 7392  
CAG AAC CTG TAT TTA TTC TTG GAC ATA TGG AGG TTC AGT AGC ATT TTA 7440  
CAC ACA CGG CCA GTG CAA AGA ACT GTT AAT AAG GAA ATT GAA ATG AGT 7488  
TCA TTA ACA TCA ACC AAC TAT GCC GAT GCA GGT ACG GAA ATA CCC TGG 7536  
TGC TTT ACA TTA ATT TTT ACA AAT GTT AGC GGA GAC GTT GAT TTG GGT 7584  
CCT TCT CTC GGT ATG ATT TCA TTA AGG ACA CAA AGA ACA TGG CTG GCC 7632  
ACA GAT CAT TAT AAC GAG AAG CGG CAG TTA CTG CAT GCT TTC ACT GAC 7680  
GGT ATT AGC TTG ACA TCA GAA GGT AGA CTG AGT GGT TTA TTT GAA GTT 7728  
GCG AAT GCA AGT TGG TTA TCA GAA GTA AAA TGG CCA CCT GAA AAA AGC 7776  
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GCG GTA AAG GCT GCT TTT GAT TAT CAT ATG TTC TTA ATC GGC ACT ATA 7872  
AGT AAC ATA CAC TTC CAT CTT CAT AAT GAA AAG GAT GCC AAG GGG GTT 7920  
CTA CCT GAT TTG CTG CAG GTC TCT TTT TCA TCA GAT GAA ATT ATC CTC 7968  
AGC TCT ACT GCA TTA GTT GTA GCA AAT ATA CTG GAT ATC TAC AAC ACC 8016  
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AGA GAT TCC AAT CCT GGT GAA TCT AGG CAA CCA ATA TTA TAC AAA GAC 8112  
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TCG GGG AAA AAA TTA AAG ACA GAT TTG CAA CTA CAA GTT TTA GAT GTT 8304  
TCT GCA GCG CTT TCT ACT TCC AAA GAA GAA TTA GAT GAG GAA GTT GGA 8352  
GCT TCC ATT GCT ATT GAT GAT TAC ATG CAT TAT GCT TCC AAG ATT GTC 8400  
GGT GGT ACT ATC ATT GAT ATT CCA AAA CTT GCT GTT CAT ATG ACA ACT 8448  
TTA CAA GAA GAA AAG ACA AAT AAT TTA GAA TAT CTA TTT GCT TGC TCT 8496  
TTT TCA GAC AAA ATA TCT GTA AGG TGG AAT CTA GGG CCT GTA GAC TTC 8544

ATA AAG GAA ATG TGG ACT ACA CAT GTC AAA GCA CTG GCA GTT CGT CGA 8592  
 TCC CAG GTA GCA AAT ATT TCC TTT GGA CAA ACT GAG GAA GAA CTT GAA 8640  
 GAA TCA ATT AAA AAG GAA GAA GCC GCT TCA AAG TTT AAT TAT ATT GCA 8688  
 CTA GAA GAA CCG CAG ATC GAA GTG CCT CAG ATA AGA GAT CTG GGA GAC 8736  
 GCC ACT CCA CCT ATG GAA TGG TTT GGT GTC AAT AGA AAA AAA TTT CCG 8784  
 AAA TTC ACT CAC CAA ACC GCA GTT ATC CCC GTC CAA AAG CTT GTT TAT 8832  
 CTT GCA GAA AAG CAG TAT GTC AAG ATA CTA GAT GAT ACG CAT 8874

(2) INFORMATION FOR SEQ ID NO: 2 :

(i) SEQUENCE CHARACTERISTICS:

(A) LENGTH: 2958 amino acids

(B) TYPE: amino acid

(D) TOPOLOGY: linear

(ii) MOLECULE TYPE: protein

(vi) ORIGINAL SOURCE:

(A) ORGANISM: *Saccharomyces cerevisiae*

(B) STRAIN: X2180-1B

(xi) SEQUENCE DESCRIPTION: SEQ ID NO: 2

Met Glu Ala Ile Ser Gln Leu Arg Gly Val Pro Leu Thr His Gln Lys  
 1 5 10 15  
 Asp Phe Ser Trp Val Phe Leu Val Asp Trp Ile Leu Thr Val Val Val  
 20 25 30  
 Cys Leu Thr Met Ile Phe Tyr Met Gly Arg Ile Tyr Ala Tyr Leu Val  
 35 40 45  
 Ser Phe Ile Leu Glu Trp Leu Leu Trp Lys Arg Ala Lys Ile Lys Ile  
 50 55 60  
 Asn Val Glu Thr Leu Arg Val Ser Leu Leu Gly Gly Arg Ile His Phe  
 65 70 75 80  
 Lys Asn Leu Ser Val Ile His Lys Asp Tyr Thr Ile Ser Val Leu Glu  
 85 90 95  
 Gly Ser Leu Thr Trp Lys Tyr Trp Leu Leu Asn Cys Arg Lys Ala Glu  
 100 105 110  
 Leu Ile Glu Asn Asn Lys Ser Ser Ser Gly Lys Lys Ala Lys Leu Pro  
 115 120 125  
 Cys Lys Ile Ser Val Glu Cys Glu Gly Leu Glu Ile Phe Ile Tyr Asn



|   |     |     |     |
|---|-----|-----|-----|
| 130   | 135 | 140 |     |
| Arg Thr Val Ala Tyr Asp Asn Val Ile Asn Leu Leu Ser Lys Asp Glu |     |     |     |
| 145   | 150 | 155 | 160 |
| Arg Asp Lys Phe Glu Lys Tyr Leu Asn Glu His Ser Phe Pro Glu Pro |     |     |     |
|   | 165 | 170 | 175 |
| Phe Ser Asp Gly Ser Ser Ala Asp Lys Leu Asp Glu Asp Leu Ser Glu |     |     |     |
|   | 180 | 185 | 190 |
| Ser Ala Tyr Thr Thr Asn Ser Asp Ala Ser Ile Val Asn Asp Arg Asp |     |     |     |
|   | 195 | 200 | 205 |
| Tyr Gln Glu Thr Asp Ile Gly Lys His Pro Lys Leu Leu Met Phe Leu |     |     |     |
|   | 210 | 215 | 220 |
| Pro Ile Glu Leu Lys Phe Ser Arg Gly Ser Leu Leu Leu Gly Asn Lys |     |     |     |
| 225   | 230 | 235 | 240 |
| Phe Thr Pro Ser Val Met Ile Leu Ser Tyr Glu Ser Gly Lys Gly Ile |     |     |     |
|   | 245 | 250 | 255 |
| Ile Asp Val Leu Pro Pro Lys Glu Arg Leu Asp Leu Tyr Arg Asn Lys |     |     |     |
|   | 260 | 265 | 270 |
| Thr Gln Met Glu Phe Lys Asn Phe Glu Ile Ser Ile Lys Gln Asn Ile |     |     |     |
|   | 275 | 280 | 285 |
| Gly Tyr Asp Asp Ala Ile Gly Leu Lys Phe Lys Ile Asp Arg Gly Lys |     |     |     |
|   | 290 | 295 | 300 |
| Val Ser Lys Leu Trp Lys Thr Phe Val Arg Val Phe Gln Ile Val Thr |     |     |     |
| 305   | 310 | 315 | 320 |
| Lys Pro Val Val Pro Lys Lys Thr Lys Lys Ser Ala Gly Thr Ser Asp |     |     |     |
|   | 325 | 330 | 335 |
| Asp Asn Phe Tyr His Lys Trp Lys Gly Leu Ser Leu Tyr Lys Ala Ser |     |     |     |
|   | 340 | 345 | 350 |
| Ala Gly Asp Ala Lys Ala Ser Asp Leu Asp Asp Val Glu Phe Asp Leu |     |     |     |
|   | 355 | 360 | 365 |
| Thr Asn His Glu Tyr Ala Lys Phe Thr Ser Ile Leu Lys Cys Pro Lys |     |     |     |
|   | 370 | 375 | 380 |
| Val Thr Ile Ala Tyr Asp Val Asp Val Pro Gly Val Val Pro His Gly |     |     |     |

|                         |                     |                 |         |
|-------------------------|---------------------|-----------------|---------|
| 385                     | 390                 | 395             | 400     |
| Ala His Pro Thr Ile     | Pro Asp Ile Asp Gly | Pro Asp Val Gly | Asn Asn |
| 405                     | 410                 | 415             |         |
| Gly Ala Pro Pro Asp Phe | Ala Leu Asp Val Gln | Ile His Gly Gly | Ser     |
| 420                     | 425                 | 430             |         |
| Ile Cys Tyr Gly Pro Trp | Ala Gln Arg Gln Val | Ser His Leu Gln | Arg     |
| 435                     | 440                 | 445             |         |
| Val Leu Ser Pro Val Val | Ser Arg Thr Ala Lys | Pro Ile Lys Lys | Leu     |
| 450                     | 455                 | 460             |         |
| Pro Pro Gly Ser Arg Arg | Ile Tyr Thr Leu Phe | Arg Met Asn Ile | Ser     |
| 465                     | 470                 | 475             | 480     |
| Ile Met Glu Asp Thr Thr | Trp Arg Ile Pro Thr | Arg Glu Ser Ser | Lys     |
| 485                     | 490                 | 495             |         |
| Asp Pro Glu Phe Leu Lys | His Tyr Lys Glu Thr | Asn Glu Glu Tyr | Arg     |
| 500                     | 505                 | 510             |         |
| Pro Phe Gly Trp Met Asp | Leu Arg Phe Cys Lys | Asp Thr Tyr Ala | Asn     |
| 515                     | 520                 | 525             |         |
| Phe Asn Ile Ser Val Cys | Pro Thr Val Gln Gly | Phe Gln Asn Asn | Phe     |
| 530                     | 535                 | 540             |         |
| His Val His Phe Leu Glu | Thr Glu Ile Arg Ser | Ser Val Asn His | Asp     |
| 545                     | 550                 | 555             | 560     |
| Ile Leu Leu Lys Ser Lys | Val Phe Asp Ile Asp | Gly Asp Ile Gly | Tyr     |
| 565                     | 570                 | 575             |         |
| Pro Leu Gly Trp Asn Ser | Lys Ala Ile Trp Ile | Ile Asn Met Lys | Ser     |
| 580                     | 585                 | 590             |         |
| Glu Gln Leu Glu Ala Phe | Leu Leu Arg Glu His | Ile Thr Leu Val | Ala     |
| 595                     | 600                 | 605             |         |
| Asp Thr Leu Ser Asp Phe | Ser Ala Gly Asp Pro | Thr Pro Tyr Glu | Leu     |
| 610                     | 615                 | 620             |         |
| Phe Arg Pro Phe Val Tyr | Lys Val Asn Trp Glu | Met Glu Gly Tyr | Ser     |
| 625                     | 630                 | 635             | 640     |
| Ile Tyr Leu Asn Val Asn | Asp His Asn Ile Val | Asn Asn Pro Leu | Asp     |

|   |     |     |
|---|-----|-----|
| 645   | 650 | 655 |
| Phe Asn Glu Asn Cys Tyr Leu Ser Leu His Gly Asp Lys Leu Ser Ile |     |     |
| 660   | 665 | 670 |
| Asp Val Thr Val Pro Arg Glu Ser Ile Leu Gly Thr Tyr Thr Asp Met |     |     |
| 675   | 680 | 685 |
| Ser Tyr Glu Ile Ser Thr Pro Met Phe Arg Met Met Leu Asn Thr Pro |     |     |
| 690   | 695 | 700 |
| Pro Trp Asn Thr Leu Asn Glu Phe Met Lys His Lys Glu Val Gly Arg |     |     |
| 705   | 710 | 715 |
| Ala Tyr Asp Phe Thr Ile Lys Gly Ser Tyr Leu Leu Tyr Ser Glu Leu |     |     |
| 725   | 730 | 735 |
| Asp Ile Asp Asn Val Asp Thr Leu Val Ile Glu Cys Asn Ser Lys Ser |     |     |
| 740   | 745 | 750 |
| Thr Val Leu His Cys Tyr Gly Phe Val Met Arg Tyr Leu Thr Asn Val |     |     |
| 755   | 760 | 765 |
| Lys Met Asn Tyr Phe Gly Glu Phe Phe Asn Phe Val Thr Ser Glu Glu |     |     |
| 770   | 775 | 780 |
| Tyr Thr Gly Val Leu Gly Ala Arg Glu Val Gly Asp Val Thr Thr Lys |     |     |
| 785   | 790 | 795 |
| Ser Ser Val Ala Asp Leu Ala Ser Thr Val Asp Ser Gly Tyr Gln Asn |     |     |
| 805   | 810 | 815 |
| Ser Ser Leu Lys Asn Glu Ser Glu Asp Lys Gly Pro Met Lys Arg Ser |     |     |
| 820   | 825 | 830 |
| Asp Leu Lys Arg Thr Thr Asn Glu Thr Asp Ile Trp Phe Thr Phe Ser |     |     |
| 835   | 840 | 845 |
| Val Trp Asp Gly Ala Leu Ile Leu Pro Glu Thr Ile Tyr Ser Phe Asp |     |     |
| 850   | 855 | 860 |
| Pro Cys Ile Ala Leu His Phe Ala Glu Leu Val Val Asp Phe Arg Ser |     |     |
| 865   | 870 | 875 |
| Cys Asn Tyr Tyr Met Asp Ile Met Ala Val Leu Asn Gly Thr Ser Ile |     |     |
| 885   | 890 | 895 |
| Lys Arg His Val Ser Lys Gln Ile Asn Glu Val Phe Asp Phe Ile Arg |     |     |

|   |      |      |
|---|------|------|
| 900   | 905  | 910  |
| Arg Asn Asn Gly Ala Asp Glu Gln Glu His Gly Leu Leu Ser Asp Leu |      |      |
| 915   | 920  | 925  |
| Thr Ile His Gly His Arg Met Tyr Gly Leu Pro Pro Thr Glu Pro Thr |      |      |
| 930   | 935  | 940  |
| Tyr Phe Cys Gln Trp Asp Ile Asn Leu Gly Asp Leu Cys Ile Asp Ser |      |      |
| 945   | 950  | 955  |
| Asp Ile Glu Phe Ile Lys Gly Phe Phe Asn Ser Phe Tyr Lys Ile Gly |      |      |
| 965   | 970  | 975  |
| Phe Gly Tyr Asn Asp Leu Glu Asn Ile Leu Leu Tyr Asp Thr Glu Thr |      |      |
| 980   | 985  | 990  |
| Ile Asn Asp Met Thr Ser Leu Thr Val His Val Glu Lys Ile Arg Ile |      |      |
| 995   | 1000 | 1005 |
| Gly Leu Lys Asp Pro Val Met Lys Ser Gln Ser Val Ile Ser Ala Glu |      |      |
| 1010  | 1015 | 1020 |
| Ser Ile Leu Phe Thr Leu Ile Asp Phe Glu Asn Glu Lys Tyr Ser Gln |      |      |
| 1025  | 1030 | 1035 |
| Arg Ile Asp Val Lys Ile Pro Lys Leu Thr Ile Ser Leu Asn Cys Val |      |      |
| 1045  | 1050 | 1055 |
| Met Gly Asp Gly Val Asp Thr Ser Phe Leu Lys Phe Glu Thr Lys Leu |      |      |
| 1060  | 1065 | 1070 |
| Arg Phe Thr Asn Phe Glu Gln Tyr Lys Asp Ile Asp Lys Lys Arg Ser |      |      |
| 1075  | 1080 | 1085 |
| Glu Gln Arg Arg Tyr Ile Thr Ile His Asp Ser Pro Tyr His Arg Cys |      |      |
| 1090  | 1095 | 1100 |
| Pro Phe Leu Leu Pro Leu Phe Tyr Gln Asp Ser Asp Thr Tyr Gln Asn |      |      |
| 1105  | 1110 | 1115 |
| Leu Tyr Gly Ala Ile Ala Pro Ser Ser Ser Ile Pro Thr Leu Pro Leu |      |      |
| 1125  | 1130 | 1135 |
| Pro Thr Leu Pro Asp Thr Ile Asp Tyr Ile Ile Glu Asp Ile Val Gly |      |      |
| 1140  | 1145 | 1150 |
| Glu Tyr Ala Thr Leu Leu Glu Thr Thr Asn Pro Phe Lys Asn Ile Phe |      |      |

|   |      |      |
|---|------|------|
| 1155  | 1160 | 1165 |
| Ala Glu Thr Pro Ser Thr Met Glu Pro Ser Arg Ala Ser Phe Ser Glu |      |      |
| 1170  | 1175 | 1180 |
| Asp Asp Asn Asp Glu Glu Ala Asp Pro Ser Ser Phe Lys Pro Val Ala |      |      |
| 1185  | 1190 | 1195 |
| Phe Thr Glu Asp Arg Asn His Glu Arg Asp Asn Tyr Val Val Asp Val |      |      |
| 1205  | 1210 | 1215 |
| Ser Tyr Ile Leu Leu Asp Val Asp Pro Leu Leu Phe Ile Phe Ala Lys |      |      |
| 1220  | 1225 | 1230 |
| Ser Leu Leu Glu Gln Leu Tyr Ser Glu Asn Met Val Gln Val Leu Asp |      |      |
| 1235  | 1240 | 1245 |
| Asp Ile Glu Ile Gly Ile Val Lys Arg Leu Ser Asn Leu Gln Glu Gly |      |      |
| 1250  | 1255 | 1260 |
| Ile Thr Ser Ile Ser Asn Ile Asp Ile His Ile Ala Tyr Leu Asn Leu |      |      |
| 1265  | 1270 | 1275 |
| Ile Trp Gln Glu Thr Gly Glu Glu Gly Phe Glu Leu Tyr Leu Asp Arg |      |      |
| 1285  | 1290 | 1295 |
| Ile Asp Tyr Gln Met Ser Glu Lys Ser Leu Glu Lys Asn Arg Thr Asn |      |      |
| 1300  | 1305 | 1310 |
| Lys Leu Leu Glu Val Ala Ala Leu Ala Lys Val Lys Thr Val Arg Val |      |      |
| 1315  | 1320 | 1325 |
| Thr Val Asn Gln Lys Lys Asn Pro Asp Leu Ser Glu Asp Arg Pro Pro |      |      |
| 1330  | 1335 | 1340 |
| Ala Leu Ser Leu Gly Ile Glu Gly Phe Glu Val Trp Ser Ser Thr Glu |      |      |
| 1345  | 1350 | 1355 |
| Asp Arg Gln Val Asn Ser Leu Asn Leu Thr Ser Ser Asp Ile Thr Ile |      |      |
| 1365  | 1370 | 1375 |
| Asp Glu Ser Gln Met Glu Trp Leu Phe Glu Tyr Cys Ser Asp Gln Gly |      |      |
| 1380  | 1385 | 1390 |
| Asn Leu Ile Gln Glu Val Cys Thr Ser Phe Asn Ser Ile Gln Asn Thr |      |      |
| 1395  | 1400 | 1405 |
| Arg Ser Asn Ser Lys Thr Glu Leu Ile Ser Lys Leu Thr Ala Ala Ser |      |      |

|   |      |      |      |
|---|------|------|------|
| 1410  | 1415 | 1420 |      |
| Glu Tyr Tyr Gln Ile Ser His Asp Pro Tyr Val Ile Thr Lys Pro Ala |      |      |      |
| 1425  | 1430 | 1435 | 1440 |
| Phe Ile Met Arg Leu Ser Lys Gly His Val Arg Glu Asn Arg Ser Trp |      |      |      |
| 1445  | 1450 | 1455 |      |
| Lys Ile Ile Thr Arg Leu Arg His Ile Leu Thr Tyr Leu Pro Asp Asp |      |      |      |
| 1460  | 1465 | 1470 |      |
| Trp Gln Ser Asn Ile Asp Glu Val Leu Lys Glu Lys Lys Tyr Thr Ser |      |      |      |
| 1475  | 1480 | 1485 |      |
| Ala Lys Asp Ala Lys Asn Ile Phe Met Ser Val Phe Ser Thr Trp Arg |      |      |      |
| 1490  | 1495 | 1500 |      |
| Asn Trp Glu Phe Ser Asp Val Ala Arg Ser Tyr Ile Tyr Gly Lys Leu |      |      |      |
| 1505  | 1510 | 1515 | 1520 |
| Phe Thr Ala Glu Asn Glu Lys His Lys Gln Asn Leu Ile Lys Lys Leu |      |      |      |
| 1525  | 1530 | 1535 |      |
| Leu Lys Cys Thr Met Gly Ser Phe Tyr Leu Thr Val Tyr Gly Glu Gly |      |      |      |
| 1540  | 1545 | 1550 |      |
| Tyr Glu Val Glu His Asn Phe Val Val Ala Asp Ala Asn Leu Val Val |      |      |      |
| 1555  | 1560 | 1565 |      |
| Asp Leu Thr Pro Pro Val Thr Ser Leu Pro Ser Asn Arg Glu Glu Thr |      |      |      |
| 1570  | 1575 | 1580 |      |
| Ile Glu Ile Thr Gly Arg Val Gly Ser Val Lys Gly Lys Phe Ser Asp |      |      |      |
| 1585  | 1590 | 1595 | 1600 |
| Arg Leu Leu Lys Leu Gln Asp Leu Ile Pro Leu Ile Ala Ala Val Gly |      |      |      |
| 1605  | 1610 | 1615 |      |
| Glu Asp Asp Lys Ser Asp Pro Lys Lys Glu Leu Ser Lys Gln Phe Lys |      |      |      |
| 1620  | 1625 | 1630 |      |
| Met Asn Thr Val Leu Leu Val Asp Lys Ser Glu Leu Gln Leu Val Met |      |      |      |
| 1635  | 1640 | 1645 |      |
| Asp Gln Thr Lys Leu Met Ser Arg Thr Val Gly Gly Arg Val Ser Leu |      |      |      |
| 1650  | 1655 | 1660 |      |
| Leu Trp Glu Asn Leu Lys Asp Ser Thr Ser Gln Ala Gly Ser Leu Val |      |      |      |

|   |      |      |      |
|---|------|------|------|
| 1665  | 1670 | 1675 | 1680 |
| Ile Phe Ser Gln Lys Ser Glu Val Trp Leu Lys His Thr Ser Val Ile |      |      |      |
| 1685  | 1690 | 1695 |      |
| Leu Gly Glu Ala Gln Leu Arg Asp Phe Ser Val Leu Ala Thr Thr Glu |      |      |      |
| 1700  | 1705 | 1710 |      |
| Ala Trp Ser His Lys Pro Thr Ile Leu Ile Asn Asn Gln Cys Ala Asp |      |      |      |
| 1715  | 1720 | 1725 |      |
| Leu His Phe Arg Ala Met Ser Ser Thr Glu Gln Leu Val Thr Ala Ile |      |      |      |
| 1730  | 1735 | 1740 |      |
| Thr Glu Ile Arg Glu Ser Leu Met Met Ile Lys Glu Arg Ile Lys Phe |      |      |      |
| 1745  | 1750 | 1755 | 1760 |
| Lys Pro Lys Ser Lys Lys Lys Ser Gln Phe Val Asp Gln Lys Ile Asn |      |      |      |
| 1765  | 1770 | 1775 |      |
| Thr Val Leu Ser Cys Tyr Phe Ser Asn Val Ser Ser Glu Val Met Pro |      |      |      |
| 1780  | 1785 | 1790 |      |
| Leu Ser Pro Phe Tyr Ile Arg His Glu Ala Lys Gln Leu Asp Ile Tyr |      |      |      |
| 1795  | 1800 | 1805 |      |
| Phe Asn Lys Phe Gly Ser Asn Glu Ile Leu Leu Ser Ile Trp Asp Thr |      |      |      |
| 1810  | 1815 | 1820 |      |
| Asp Phe Phe Met Thr Ser His Gln Thr Lys Glu Gln Tyr Leu Arg Phe |      |      |      |
| 1825  | 1830 | 1835 | 1840 |
| Ser Phe Gly Asp Ile Glu Ile Lys Gly Gly Ile Ser Arg Glu Gly Tyr |      |      |      |
| 1845  | 1850 | 1855 |      |
| Ser Leu Ile Asn Val Asp Ile Ser Ile Ser Met Ile Lys Leu Thr Phe |      |      |      |
| 1860  | 1865 | 1870 |      |
| Ser Glu Pro Arg Arg Ile Val Asn Ser Phe Leu Gln Asp Glu Lys Leu |      |      |      |
| 1875  | 1880 | 1885 |      |
| Ala Ser Gln Gly Ile Asn Leu Leu Tyr Ser Leu Lys Pro Leu Phe Phe |      |      |      |
| 1890  | 1895 | 1900 |      |
| Ser Ser Asn Leu Pro Lys Lys Glu Lys Gln Ala Pro Ser Ile Met Ile |      |      |      |
| 1905  | 1910 | 1915 | 1920 |
| Asn Trp Thr Leu Asp Thr Ser Ile Thr Tyr Phe Gly Val Leu Val Pro |      |      |      |

|   |                                     |      |
|---|-------------------------------------|------|
| 1925  | 1930                                | 1935 |
| Val Ala Ser Thr Tyr Phe Val                                     | Phe Glu Leu His Met Leu Leu Leu Ser |      |
| 1940  | 1945                                | 1950 |
| Leu Thr Asn Thr Asn Asn Gly Met Leu Pro Glu Glu Thr Lys Val Thr |                                     |      |
| 1955  | 1960                                | 1965 |
| Gly Gln Phe Ser Ile Glu Asn Ile Leu Phe Leu Ile Lys Glu Arg Ser |                                     |      |
| 1970  | 1975                                | 1980 |
| Leu Pro Ile Gly Leu Ser Lys Leu Leu Asp Phe Ser Ile Lys Val Ser |                                     |      |
| 1985  | 1990                                | 1995 |
| Thr Leu Gln Arg Thr Val Asp Thr Glu Gln Ser Phe Gln Val Glu Ser |                                     |      |
| 2005  | 2010                                | 2015 |
| Ser His Phe Arg Val Cys Leu Ser Pro Asp Ser Leu Leu Arg Leu Met |                                     |      |
| 2020  | 2025                                | 2030 |
| Trp Gly Ala His Lys Leu Leu Asp Leu Ser His Tyr Tyr Ser Arg Arg |                                     |      |
| 2035  | 2040                                | 2045 |
| His Ala Pro Asn Ile Trp Asn Thr Lys Met Phe Thr Gly Lys Ser Asp |                                     |      |
| 2050  | 2055                                | 2060 |
| Lys Ser Lys Glu Met Pro Ile Asn Phe Arg Ser Ile His Ile Leu Ser |                                     |      |
| 2065  | 2070                                | 2075 |
| Tyr Lys Phe Cys Ile Gly Trp Ile Phe Gln Tyr Gly Ala Gly Ser Asn |                                     |      |
| 2085  | 2090                                | 2095 |
| Pro Gly Leu Met Leu Gly Tyr Asn Arg Leu Phe Ser Ala Tyr Glu Lys |                                     |      |
| 2100  | 2105                                | 2110 |
| Asp Phe Gly Lys Phe Thr Val Val Asp Ala Phe Phe Ser Val Ala Asn |                                     |      |
| 2115  | 2120                                | 2125 |
| Gly Asn Thr Ser Ser Thr Phe Phe Ser Glu Gly Asn Glu Lys Asp Lys |                                     |      |
| 2130  | 2135                                | 2140 |
| Tyr Asn Arg Ser Phe Leu Pro Asn Met Gln Ile Ser Tyr Trp Phe Lys |                                     |      |
| 2145  | 2150                                | 2155 |
| Arg Cys Gly Glu Leu Lys Asp Trp Phe Phe Arg Phe His Gly Glu Ala |                                     |      |
| 2165  | 2170                                | 2175 |
| Leu Asp Val Asn Phe Val Pro Ser Phe Met Asp Val Ile Glu Ser Thr |                                     |      |



|   |      |      |
|---|------|------|
| 2180  | 2185 | 2190 |
| Leu Gln Ser Met Arg Ala Phe Gln Glu Leu Lys Lys Asn Ile Leu Asp |      |      |
| 2195  | 2200 | 2205 |
| Val Ser Glu Ser Leu Arg Ala Glu Asn Asp Asn Ser Tyr Ala Ser Thr |      |      |
| 2210  | 2215 | 2220 |
| Ser Val Glu Ser Ala Ser Ser Ser Leu Ala Pro Phe Leu Asp Asn Ile |      |      |
| 2225  | 2230 | 2235 |
| Arg Ser Val Asn Ser Asn Phe Lys Tyr Asp Gly Gly Val Phe Arg Val |      |      |
| 2245  | 2250 | 2255 |
| Tyr Thr Tyr Glu Asp Ile Glu Thr Lys Ser Glu Pro Ser Phe Glu Ile |      |      |
| 2260  | 2265 | 2270 |
| Lys Ser Pro Val Val Thr Ile Asn Cys Thr Tyr Lys His Asp Glu Asp |      |      |
| 2275  | 2280 | 2285 |
| Lys Val Lys Pro His Lys Phe Arg Thr Leu Ile Thr Val Asp Pro Thr |      |      |
| 2290  | 2295 | 2300 |
| His Asn Thr Leu Tyr Ala Gly Cys Ala Pro Leu Leu Met Glu Phe Ser |      |      |
| 2305  | 2310 | 2315 |
| Glu Ser Leu Gln Lys Met Ile Lys Lys His Ser Thr Asp Glu Lys Pro |      |      |
| 2325  | 2330 | 2335 |
| Asn Phe Thr Lys Pro Ser Ser Gln Asn Val Asp Tyr Lys Arg Leu Leu |      |      |
| 2340  | 2345 | 2350 |
| Asp Gln Phe Asp Val Ala Val Lys Leu Thr Ser Ala Lys Gln Gln Leu |      |      |
| 2355  | 2360 | 2365 |
| Ser Leu Ser Cys Glu Pro Lys Ala Lys Val Gln Ala Asp Val Gly Phe |      |      |
| 2370  | 2375 | 2380 |
| Glu Ser Phe Leu Phe Ser Met Ala Thr Asn Glu Phe Asp Ser Glu Gln |      |      |
| 2385  | 2390 | 2395 |
| Pro Leu Glu Phe Ser Leu Thr Leu Glu His Thr Lys Ala Ser Ile Lys |      |      |
| 2405  | 2410 | 2415 |
| His Ile Phe Ser Arg Glu Val Ser Thr Ser Phe Glu Val Gly Phe Met |      |      |
| 2420  | 2425 | 2430 |
| Asp Leu Thr Leu Leu Phe Thr His Pro Asp Val Ile Ser Met Tyr Gly |      |      |

|   |      |      |
|---|------|------|
| 2435  | 2440 | 2445 |
| Thr Gly Leu Val Ser Asp Leu Ser Val Phe Phe Asn Val Lys Gln Leu |      |      |
| 2450  | 2455 | 2460 |
| Gln Asn Leu Tyr Leu Phe Leu Asp Ile Trp Arg Phe Ser Ser Ile Leu |      |      |
| 2465  | 2470 | 2475 |
| His Thr Arg Pro Val Gln Arg Thr Val Asn Lys Glu Ile Glu Met Ser |      | 2480 |
| 2485  | 2490 | 2495 |
| Ser Leu Thr Ser Thr Asn Tyr Ala Asp Ala Gly Thr Glu Ile Pro Trp |      |      |
| 2500  | 2505 | 2510 |
| Cys Phe Thr Leu Ile Phe Thr Asn Val Ser Gly Asp Val Asp Leu Gly |      |      |
| 2515  | 2520 | 2525 |
| Pro Ser Leu Gly Met Ile Ser Leu Arg Thr Gln Arg Thr Trp Leu Ala |      |      |
| 2530  | 2535 | 2540 |
| Thr Asp His Tyr Asn Glu Lys Arg Gln Leu Leu His Ala Phe Thr Asp |      |      |
| 2545  | 2550 | 2555 |
| Gly Ile Ser Leu Thr Ser Glu Gly Arg Leu Ser Gly Leu Phe Glu Val |      |      |
| 2565  | 2570 | 2575 |
| Ala Asn Ala Ser Trp Leu Ser Glu Val Lys Trp Pro Pro Glu Lys Ser |      |      |
| 2580  | 2585 | 2590 |
| Lys Asn Thr His Pro Leu Val Ser Thr Ser Leu Asn Ile Asp Asp Ile |      |      |
| 2595  | 2600 | 2605 |
| Ala Val Lys Ala Ala Phe Asp Tyr His Met Phe Leu Ile Gly Thr Ile |      |      |
| 2610  | 2615 | 2620 |
| Ser Asn Ile His Phe His Leu His Asn Glu Lys Asp Ala Lys Gly Val |      |      |
| 2625  | 2630 | 2635 |
| Leu Pro Asp Leu Leu Gln Val Ser Phe Ser Ser Asp Glu Ile Ile Leu |      | 2640 |
| 2645  | 2650 | 2655 |
| Ser Ser Thr Ala Leu Val Val Ala Asn Ile Leu Asp Ile Tyr Asn Thr |      |      |
| 2660  | 2665 | 2670 |
| Ile Val Arg Met Arg Gln Asp Asn Lys Ile Ser Tyr Met Glu Thr Leu |      |      |
| 2675  | 2680 | 2685 |
| Arg Asp Ser Asn Pro Gly Glu Ser Arg Gln Pro Ile Leu Tyr Lys Asp |      |      |

|   |      |      |      |
|---|------|------|------|
| 2690  | 2695 | 2700 |      |
| Ile Leu Arg Ser Leu Lys Leu Leu Arg Thr Asp Leu Ser Val Asn Ile |      |      |      |
| 2705  | 2710 | 2715 | 2720 |
| Ser Ser Ser Lys Val Gln Ile Ser Pro Ile Ser Leu Phe Asp Val Glu |      |      |      |
|   | 2725 | 2730 | 2735 |
| Val Leu Val Ile Arg Ile Asp Lys Val Ser Ile Arg Ser Glu Thr His |      |      |      |
|   | 2740 | 2745 | 2750 |
| Ser Gly Lys Lys Leu Lys Thr Asp Leu Gln Leu Gln Val Leu Asp Val |      |      |      |
|   | 2755 | 2760 | 2765 |
| Ser Ala Ala Leu Ser Thr Ser Lys Glu Glu Leu Asp Glu Glu Val Gly |      |      |      |
|   | 2770 | 2775 | 2780 |
| Ala Ser Ile Ala Ile Asp Asp Tyr Met His Tyr Ala Ser Lys Ile Val |      |      |      |
| 2785  | 2790 | 2795 | 2800 |
| Gly Gly Thr Ile Ile Asp Ile Pro Lys Leu Ala Val His Met Thr Thr |      |      |      |
|   | 2805 | 2810 | 2815 |
| Leu Gln Glu Glu Lys Thr Asn Asn Leu Glu Tyr Leu Phe Ala Cys Ser |      |      |      |
|   | 2820 | 2825 | 2830 |
| Phe Ser Asp Lys Ile Ser Val Arg Trp Asn Leu Gly Pro Val Asp Phe |      |      |      |
|   | 2835 | 2840 | 2845 |
| Ile Lys Glu Met Trp Thr Thr His Val Lys Ala Leu Ala Val Arg Arg |      |      |      |
|   | 2850 | 2855 | 2860 |
| Ser Gln Val Ala Asn Ile Ser Phe Gly Gln Thr Glu Glu Glu Leu Glu |      |      |      |
| 2865  | 2870 | 2875 | 2880 |
| Glu Ser Ile Lys Lys Glu Glu Ala Ala Ser Lys Phe Asn Tyr Ile Ala |      |      |      |
|   | 2885 | 2890 | 2895 |
| Leu Glu Glu Pro Gln Ile Glu Val Pro Gln Ile Arg Asp Leu Gly Asp |      |      |      |
|   | 2900 | 2905 | 2910 |
| Ala Thr Pro Pro Met Glu Trp Phe Gly Val Asn Arg Lys Lys Phe Pro |      |      |      |
|   | 2915 | 2920 | 2925 |
| Lys Phe Thr His Gln Thr Ala Val Ile Pro Val Gln Lys Leu Val Tyr |      |      |      |
|   | 2930 | 2935 | 2940 |
| Leu Ala Glu Lys Gln Tyr Val Lys Ile Leu Asp Asp Thr His         |      |      |      |

2945

2950

2955